

An Update on the Epidemiology of Lyme Disease in California

The Federal Drug Administration's approval of the first human Lyme disease (LD) vaccine (LYMERix™, GlaxoSmithKline Pharmaceuticals) in 1998 focused national attention anew on LD, from both physicians and the public. Medical strategies for the prevention and diagnosis of LD depend chiefly on the patient's likelihood of exposure to *Borrelia burgdorferi*, the bacterial agent that causes LD. The purpose of this update is to provide current epidemiologic information on LD, particularly as it pertains to California.

Lyme disease was first described in 1977 as a cluster of oligoarticular arthritis in children and adults near Lyme, Connecticut. Investigations eventually identified the spirochetal agent, *Borrelia burgdorferi*, and the tick vector, *Ixodes scapularis* (the "deer tick"), of this disease.



Western black-legged tick, shown actual size at left.

Source: California Department of Health Services

Services (CDHS) in 1989; as of 2000, over 1,700 cases have been reported from 52 of 58 counties.

Early symptoms of LD occur 3 to 30 days after the bite of an infected tick. Symptoms of early Lyme disease can include erythema migrans (EM), described as a red, blotchy, expanding rash, accompanied by fever, headache, neckache, muscle and joint pain. The EM is not always present or may go undetected by a patient or physician if it occurs in a location difficult to see (e.g., scalp) or if the patient has dark skin. Weeks to months after the bite of an infected tick, the spirochetes disseminate, resulting in cardiac conduction defects (atrio-ventricular block) and cranial and peripheral

The Centers for Disease Control and Prevention (CDC) made LD a nationally notifiable condition in 1982. Over 125,000 cases have since been reported nationwide, making LD the most frequently reported vector-borne disease.

The first recognized human case in California occurred in 1978 in a hiker from Sonoma County. Passive surveillance for LD cases began at the California Department of Health

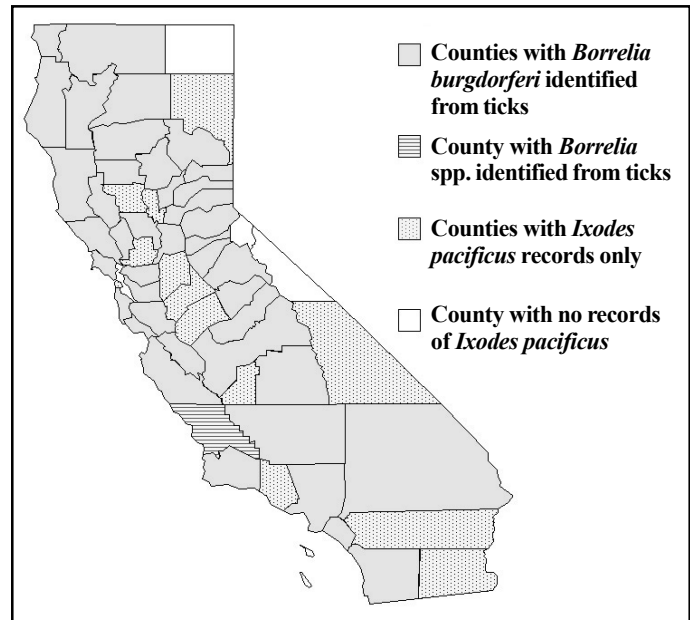


Figure 1: Distribution of infection with *Borrelia* spp. in the western black-legged tick (*Ixodes pacificus*). *Borrelia burgdorferi* is the agent that causes Lyme disease. *Borrelia* spp. refers to bacterial isolates closely related, but not identical, to *Borrelia burgdorferi*. (Source of data: Mosquito and Vector Control Agencies of California, University of California, Berkeley, Vector-Borne Disease Section, California Department of Health Services)

neuropathies often exhibited as a unilateral facial palsy, or numbness and pain in arms and legs.

If left untreated or improperly treated, late LD can occur weeks, months, or years after infection. Chronic arthritis, manifested as recurrent swelling of one or a few joints, is the most common feature of late LD. Chronic muscle pain and encephalopathies, such as memory loss and difficulty in concentrating, may also be present.

Diagnosis is based primarily on clinical presentation and supportive history, such as exposure to ticks or environments where ticks occur.

The enzyme immunoassay (ELISA) followed by a confirmatory western blot are serologic tests useful to support the clinical diagnosis. However, it should be noted that false negative results, particularly early in the disease (< 4-6 weeks post infection), as well as false positive results, occur.

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Treatment with antibiotics during the early symptoms can cure the infection and can prevent progression to late LD. Several reviews have been published that discuss diagnosis and treatment of this complex disease (1-4).

The tick that transmits *B. burgdorferi* to humans in California is the western black-legged tick, *Ixodes pacificus*. Of the tick's three life stages—larva, nymph and adult—only nymphs and adults can transmit LD bacteria to humans. However, nymphs transmit *B. burgdorferi* to humans more frequently than do adult ticks because nymphs are small (~ 1 mm) and thus difficult to see. Also, in many parts of California, a higher percentage of nymphs than adults carries *B. burgdorferi*.

For example, in Mendocino County, one of the few Californian counties where long-term studies on Lyme disease have been performed, the nymphal infection rate was 41.3% (5) while the adult tick infection rate in that county was 4% (6). In general, nymphs are active from March through July whereas adult ticks are most active from November through March. However, if conditions are favorable, ticks may be active at any time of the year. *Ixodes pacificus* have been collected from 55 of 58 California counties. The *B. burgdorferi* bacterium has been identified from *I. pacificus* ticks in 41 California counties (figure 1).

Californians' contact with *B. burgdorferi*-infected ticks will increase as residential communities expand into areas where there was once only wildlife. Recreational activities in natural areas will similarly increase, placing people in contact with ticks. Both physicians and the public need to be aware of the attendant risks of Lyme and other tick-borne diseases.

The LYMERix™ vaccine (GlaxoSmithKline Pharmaceuticals) is a recently approved tool for LD prevention. Based on current information on vaccine safety and efficacy, and the known epidemiology of LD in California, CDHS does not recommend the LD vaccine for **routine** use anywhere in California.

For more information on Lyme disease in California and to obtain a copy of the Guidelines for Lyme Disease Vaccine Use in California for Health Care Providers, please visit the California Department of Health Services, Division of Communicable Disease Control Web site: www.dhs.ca.gov/ps/dcdc/html/disbindex.htm, or contact the CDHS Vector-Borne Disease Section at (916) 324-3738.

Reference List

- (1) Rahn DW, Evans J. Lyme Disease. 1 ed. Philadelphia, PA: American College of Physicians, 1998.
- (2) Steere AC. Lyme disease. N Engl J Med 2001 July; 345(2):115-25.

TICK AVOIDANCE TIPS

Tick avoidance remains the best line of defense against Lyme disease and other tick-borne diseases that occur in California, including Rocky Mountain spotted fever, ehrlichiosis, babesiosis, and tick paralysis.

People who live or recreate in areas where ticks occur should be advised to:

- Wear long pants and long-sleeved shirts. Tuck pant legs into boots or socks, and tuck shirts into pants.
- Wear light-colored clothing so ticks can be easily seen.
- Use a repellent registered for use against ticks. Always follow directions on the container and be extra careful when applying to children.
- Stay in the middle of the trail: avoid trail margins, brush and grassy areas when in tick country.
- Inspect yourself frequently for ticks while in tick habitat. Once out of tick habitat, thoroughly check your entire body for ticks. Parents should examine their children, especially on the scalp and hairline, after activities in tick-infested areas.
- Remove ticks promptly to decrease the risk of spirochete transmission. Ticks must be attached and feeding for at least 24 hours before they are capable of transmitting the *Borrelia* organism.

- (3) Nadelman RB, Nowakowski J, Fish D et al. Prophylaxis with single-dose doxycycline for the prevention of Lyme disease after an *Ixodes scapularis* tick bite. N Engl J Med 2001 July; 345(2):79-84.
- (4) Klemperer MS, Hu LT, Evans J et al. Two controlled trials of antibiotic treatment in patients with persistent symptoms and a history of Lyme disease. N Engl J Med 2001 July; 345(2):85-92.
- (5) Tälleklint-Eisen L, Lane RS. Variation in the density of questing *Ixodes pacificus* (Acari:Ixodidae) nymphs infected with *Borrelia burgdorferi* at different spatial scales in California. Journal of Parasitology 1999; 85(5):824-31.
- (6) Clover JR, Lane RS. Evidence implicating nymphal *Ixodes pacificus* (Acari: ixodidae) in the epidemiology of Lyme disease in California. American Journal of Tropical Medicine and Hygiene 1995; 53(3):237-40.